

REMARKS

This responds to the Office Action mailed on July 12, 2006.

Claims 1, 4, and 5 are amended; as a result, claims 1-17 are now pending in this application.

Answer to Response to Arguments

The Advisory Action and the instant Office Action state although “it is difficult to determine if 28 is on the recessed part of 32, layer 34 still meets the claimed limitation.” (Office Action at page 5).

Applicant respectfully asserts that it is not difficult to determine the TiN barrier layer 28 is above and Ng’s first interconnect (the structure sequestered by a structure line, and bearing the description Al-Si-Cu).

Firstly, Ng calls out metal layer 32. In each instance where Ng is referring to his “present invention” (Ng at col. 2 line 10), he describes his metal layer 32 as Al/Cu/Si. Notice the sequence is different from the disparaged Al-Si-Cu. Each time the sequence Al-Si-Cu is mentioned, it is disparaged as prior art. References to the Al-Si-Cu sequence include column 2, line 43 (“stresses which cause peeling and blemishing”), column 5, line 11 (“have the same blemishing and void problem with involves the Al-Si-Cu layer”), column 6, line 23 (“the problem of peeling only occurs between the Al-Si-Cu 32 48”), and column 7, line 39 (“and eliminates peeling problems”). Further to the point, in each instance, including claims, where Ng teaches his invention, he uses the sequence Al/Cu/Si. References to Al/Cu/Si include column 2, line 16 (“defect free/reduced stress”), column 3, line 53 (“preferably composed of Al/Cu/Si”), column 5, line 29 (“preferably composed of Al/Cu/Si”), and claims 1, 5, and 10. Hence, it is clear that the structure 32 in FIG. 6 is preferably composed of Al/Cu/Si, but the interconnect at the level of layer 20, is composed of Al-Si-Cu.

Secondly, the interconnect composed of Al-Si-Cu is distinguished as different from the structure 32 because of the horizontal line that demarcates a boundary.

Thirdly, the TiN layer 28 has been breached by a process that necessitates putting the Al-Si-Cu interconnect into place.

Fourthly, Ng does not bother with a TiN layer “above and on the interconnect at the level of layer 40”, but Ng clearly shows a structural boundary with another horizontal line.

And fifthly, although Ng does not label the two aforementioned interconnects, they are depicted as discrete and separate structures from the metal lines 32 and 48, and neither discrete interconnect has a “diffusion barrier layer above and on the ... interconnect”. (Claim 1).

Applicant respectfully asserts that Ng is consistent in both teaching and illustrating discrete and separate structures between his interconnects and his metal lines. And Ng also is consistent where he fails to teach a diffusion barrier layer above and on the interconnects.

§102 Rejection of the Claims

Claims 1, 3 and 7 were rejected under 35 USC § 102(c) as being anticipated by Ng (U.S. 5,994,217). Applicant respectfully traverses this rejection and requests the Office to consider the following.

“A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” (*Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987), M.P.E.P. §2131, 8th Ed., Rev. 1).

Claim 1 requires, among others

forming a conductive first diffusion barrier layer *above and on* the first interconnect ...

These claim limitations therefore require that the conductive first diffusion barrier layer be both above, and on, the first interconnect.

Applicant has read and understood the Final Office Action. In response to the Final Office Action and the *Response to Arguments* (Office Action at page 4), Applicant respectfully asserts that Ng teaches a TiN barrier layer 28, but it is not formed above and on the Al-Si-Cu interconnect, which must be read as the first interconnect (required by Applicant’s claim 1). Instead, the TiN barrier layer 28 is *below* and on the Al-Si-Cu interconnect, and the metal line 32 is above and on the Al-Si-Cu interconnect. Because Applicant claims a process in claim 1, this is not an anticipatory teaching by Ng. Ng does not teach how the Al-Si-Cu structure (interconnect) at the level of layer 20 is formed. In any event, when the metal layer 28 is formed

it is neither formed above and on an interconnect, nor below and on. Rather as to teaching a process, Ng merely teaches, if at all, forming an interconnect that breaches layer 28. And the sequence Ng teaches is also not enabling since as claim 1 requires forming the conductive first diffusion barrier layer above and on the first interconnect.

The only teaching of an etch that breaches layer 28 is given at column 4, lines 61-62: “the metal layer 28 32 34 is etched using chlorine containing gas” Ng does not teach forming the recess into which is located the Al-Si-Cu structure at the level of layer 20. Ng is therefore devoid of any enabling teaching. One cannot determine whether the layer 28 is formed above and on the Al-Si-Cu structure, followed by an etch. Neither can one determine whether the layer 28 is formed immediately following the formation of layer 24, in which case layer 28 would coat layer 24 in the recess in which is located the Al-Si-Cu structure. FIG. 6 in Ng is also indefinite because layer 28 has no boundary definition coplanar with the Al-Si-Cu structure. Because Ng is not enabled to teach the chronological formation of the layer 28, Ng cannot be enabled to teach “forming a conductive first diffusion barrier layer above and on the first interconnect” (Claim 1). Because Ng does not anticipate claim 1, withdrawal of the rejections is respectfully requested.

The Office Action has a statement in a previous Office Action that is difficult to understand. It states, “[c]learly, in figure 6, the contact is formed in each of the ILD’s to expose the barrier layer (sic)” Because the phrase ends without punctuation, it is not clear to Applicant’s counsel if the phrase was intended to end with the word “layer”. And the assertion is not germane to the limitation of claim 1 of a method to “expose the first conductive diffusion barrier layer” because in Ng, the upper via can only expose layer 34, not the “first conductive diffusion barrier layer”. Withdrawal of the rejections is respectfully requested.

Claims 3 and 7 depend from claim 1. Because Ng does not anticipate claim 1, Ng also does not anticipate claims 3 and 7. Withdrawal of the rejections is respectfully requested.

§103 Rejection of the Claims

Claims 2, 4-6 and 8-17 were rejected under 35 USC § 103(a) as being unpatentable over Ng. Applicant respectfully traverses the rejection and requests the Office to consider the following.

To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. In re Vaack, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). (M.P.E.P. § 2143 8th Ed, Rev.1).

Applicant has read and understood the Final Office Action. The Final Office Action admits that “Ng lacks anticipation only in not teaching that an organic ILD may be used and that the barrier layers may be formed by electroless plating.” (Office Action at page 4). That the Office Action asserts that “Ng suggests that the metal layers may be formed by other metal processes” (Office Action at page 4), represents a non-enabling invitation to experiment. The statement further refers to the “metal processes” which neither teaches nor suggests anything regarding an organic ILD. Since all the elements the claims are admitted not to be found in the cited reference, and since the rejection is based upon a single-reference action, Applicant respectfully asserts that all the claim limitations are not taught.

Because the Office is asserting something without a teaching or suggestion found in the cited reference, Applicant assumes the Office is taking official notice of the missing elements from an undisclosed source. Applicant respectfully objects to the taking of official notice, and pursuant to M.P.E.P. § 2144.03, Applicant traverses the assertion of official notice and requests that the Office cite a reference that teaches the missing element. If the Office cannot cite a reference that teaches the missing element, applicant respectfully requests that the Office provide an affidavit that describes how the missing element is present in the prior art. If the Office cannot cite a reference or provide an affidavit, Applicant requests withdrawal of the rejections.

Conclusion


Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney ((801) 278-9171) to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

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